

课程大纲

COURSE SYLLABUS

1.	课程代码/名称 Course Code/Title	功能软材料与 4D 打印 Soft Functional Materials and 4D Printing
2.	课程性质 Compulsory/Elective	专业选修课 Major Elective Course
3.	课程学分/学时 Course Credit/Hours	3/48
4.	授课语言 Teaching Language	中英双语 English & Chinese
5.	授课教师 Instructor(s)	葛琦, 副教授, 机械与能源工程系, Email: geq@sustc.edu.cn, Qi Ge, Associate Professor, Department of Mechanical and Energy Engineering, Email: geq@sustech.edu.cn
6.	是否面向本科生开放 Open to undergraduates or not	否 No
7.	先修要求 Pre-requisites	ME5213 软材料学科前沿 (非必须) Frontiers of Soft Materials Science (Optional)
8.	教学目标 Course Objectives	<p>(如面向本科生开放, 请注明区分内容。 If the course is open to undergraduates, please indicate the difference.)</p> <p>通过该课程的教学使学生掌握功能软材料的定义、分类及其高分子物理基础, 相关 3D 打印技术的最新进展, 以及通过 3D 打印功能软材料所实现的 4D 打印技术的基本原理和力学设计方法。</p> <p>The objectives of this course are to let students understand the definition, classification and fundamental physics of soft functional material, the advances of the relevant 3D printing technologies, and the basic principles and mechanics design approaches of 4D printing technologies which are realized by 3D printing soft functional materials.</p>
9.	教学方法 Teaching Methods	<p>(如面向本科生开放, 请注明区分内容。 If the course is open to undergraduates, please indicate the difference.)</p> <p>教室讲授, 使用多媒体授课, 进行案例解析, 期中考试, 并设置课程报告环节, Class room lecture, applying multimedia, case and reference study, mid-term exam, class project (writing report + oral presentation)</p>
10.	教学内容 Course Contents	(如面向本科生开放, 请注明区分内容。 If the course is open to undergraduates, please indicate the difference.)
	Section 1	功能软材料与 3D/4D 打印技术简介

(4 credits)	Introduction to soft functional materials and 3D/4D printing technologies
Section 2 (2 credits)	高分子的介绍与分类 Introduction to and classification of polymers
Section 3 (3 credits)	形状记忆高分子与 4D 打印 Shape memory polymers and 4D printing
Section 4 (3 credits)	水凝胶与 4D 打印 Hydrogel and 4D printing
Section 5 (2 credits)	介电弹性体与 4D 打印 Dielectric elastomer and 4D printing
Section 6 (2 credits)	磁响应软材料与 4D 打印 Magnetic responsive soft materials and 4D printing
Section 7 (2 credits)	液晶弹性体与 4D 打印 Liquid elastomer and 4D printing
Section 8 (4 credits)	高分子的结构与构型 Polymer structure and configuration
Section 9 (6 credits)	理想链高分子模型与熵弹性 Polymer ideal chain model and entropic elasticity
Section 10 (3 credits)	非晶态高分子 Polymer amorphous state
Section 11 (3 credits)	晶态高分子 Polymer crystalline state
Section 12 (3 credits)	玻璃态-橡胶态转化 Glass-rubber transition
Section 13 (3 credits)	高分子粘弹性与流变学 Polymer viscoelasticity and rheology
Section 14 (3 credits)	4D 打印: 材料与结构设计 4D printing: material and structure design
Section 15 (3 credits)	4D 打印: 多物理场建模 4D printing: multiphysics modeling
11. 课程考核 Course Assessment	
	(1) 考核形式 Form of examination: Assessment (2) 分数构成 grading policy: a.出勤 Attendance 5%; b.课堂表现 Class performance 10%; c.期中考试 Mid-term exam 40%; d.期末报告 Final report/presentation 45%
12. 教材及其它参考资料 Textbook and Supplementary Readings	
	教材及参考材料: L.H. Sperling. Introduction to Physical Polymer Science – WILEY. H. F. Brinson, L. C. Brinson. Polymer Engineering Science and Viscoelasticity – Springer. Michael Rubinstein, Ralph H. Colby. Polymer Physics -- OXFORD.

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